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RESEARCH ARTICLE

A review of leaf-miner tephritid flies (Diptera, Tephritidae) of the south-eastern part of West Siberia, Russia

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Abstract

Eleven leaf-miner tephritid fly species from 7 genera are reviewed for four regions in the south-eastern part of West Siberia, Russia, namely Tomskaya and Kemerovskaya Oblasts, Altaiskii Krai, and Republics of Altai and Khakassia. The share of leaf-miner species in the tephritid fly fauna of the region is 10.2%. *Cornutrypeta svetlanae* Richter & Shcherbakov, 2000, recorded from four regions, is the most numerous and widely distributed species preferring forest belt in the mountains of Kuznetskii Alatau (Kemerovskaya Oblast and Khakassia), North Altai (Republic of Altai) and West Altai (Altaiskii Krai). Two species are registered in only one region, namely *Cornutrypeta spinifrons* (Schroeder, 1913) in the forest belt of the Kuznetskii Alatau mountains (Kemerovskaya Oblast) and *Hemilea dimidiata* (Costa, 1844) in the forest meadows of Tomskaya Oblast. The rarest species in the region are *Cornutrypeta spinifrons* (Schroeder, 1913) and *Trypeta zoe* Meigen, 1826 known by single or several specimens only. Comments on the distribution and trophic relation of all the species are provided.

Keywords

Diptera, Tephritidae, leaf-miner, West Siberia, distribution, trophic relation

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Introduction

Tephritid flies, characterized by their life-cycle that involves their pre-imaginal development in different parts of plants, include leaf-miner species which form a topological group within this family. Leaf-mining is recorded in both long-horned flies (Chironomidae, Sciaridae) and the short-horned flies (Agromyzidae, Anthomyiidae, Drosophilidae, Ephydridae, Psilidae, Scathophagidae, Syrphidae). The largest number are found in the family Agromyzidae, but other families include species representatives in several different genera; for example, the family Tephritidae includes several representatives of the tribe Trypetini which are known to be leaf-miners of herbal plants, mainly of the family Asteraceae.

Tephritidae is one of the largest dipteran family included about 4350 species from 480 genera worldwide, and about 850 species in Palearctic (Korneyev, Ovtshinnikova 2004). The tephritid fly fauna of Russia is still insufficiently known, only European part of Russia and the Russian Far East are relatively well studied. 190 species of tephritid flies from 53 genera were listed in the Key to insects of European Part of USSR (Richter 1970), of which 25 species from 16 genera were recorded for West Siberia. 250 species from 88 genera are registered for the Russian Far East, of which 39 species from 21 genera are occurring in West Siberia (Korneyev, Ovtshinnikova 2004), the territory which is carefully studying at present time and presumably inhabited by more than 100 species from 36 genera (Shcherbakov 2016).

The leaf-miner tephritid fly fauna in the south-eastern part of West Siberia have been studied in Tomskaya and Kemerovskaya Oblasts, Altaiskii Krai, Republics of Altai and Khakassia over the past 20 years. The first information regarding leaf-miner tephritid flies of West Siberia were presented in the review of species from Kuznetskii Alatau (Shcherbakov 2002) and the analysed data were published in an International Conference Proceedings (Shcherbakov 2015). To date, 10 leaf-miner tephritid fly species have been discovered in the south-eastern part of West Siberia, Russia. A list of these species is presented below and their taxonomic structure is given according to the Systematic Database of Tephritidae names (Norrbom et al. 1999). Data on trophic relation and a distribution of species are also provided. Most of host-plants are belonging to the family Asteraceae which is not noted in the list below, unless otherwise noted, name of plant family is provided.

Material and methods

The material was collected mainly by entomological net-sweeping, as imago-rearing from leaf-mines was not effective enough. Currently, trophic relations for a number of tephritid species in the region remains unknown.

Most of the material cited in the present article is housed in the collection of Tomsk State University, Russia (not noted in the list below), and the remainder is housed in the Zoological Institute, Saint Petersburg (ZIN); unless otherwise noted, specimens were collected by M. Shcherbakov.

Taxonomy

Acidia Robineau-Desvoidy, 1830

Acidia cognata (Wiedemann, 1817)

Material. Tomskaya Oblast, Tomsk: 1 ♂, "Universitetskaya roshcha" park in city centre, 22.VI.98; 1 ♂, experimental area of Botanical Garden, from leaf-mines on *Tussilago farfara*, collected IX.2014, emergence 8.I.2015. **Kemerovskaya Oblast:** 1 ♂, "Kuznetskii Alatau" State Reserve, 97 km NE Novokuznetsk, upper stream of Srednyaya Ters river, from leaf-mines on *Petasites radiatus* on bank, collected 4.VIII.1996, imago emergence 11.X.1996; 1 ♀, 80 km S of Tisul village, near Belogorsk vill., Kiya-Shaltyr river, shallow bank, from leaf-mines on *Petasites radiatus*, collected 13.VIII.2000, imago emergence 13.XI.2000. **Republic of Khakassia:** 3 ♂, 54°27'05"N, 89°26'59"E, 32.5 km SWW Shira village, near Efremkino village, 480 m a.s.l., left bank of Belyi Iyus river, willow bed, 4.VIII.2019.

Trophic relations. In Europe was reared from leaf-mines on *Homogyne alpina*, *H. discolor*, *Petasites albus*, *P. hybridus*, *P. paradoxus*, *P. pyrenaicus*, *P. spurius* and *Tussilago farfara* (Ellis 2020), and reared in the region from *Petasites radiatus* and *Tussilago farfara* leaf-mines.

Cornutrypeta Han & Wang, 1993

Cornutrypeta spinifrons (Schroeder, 1913)

Material. Kemerovskaya Oblast: 1♂, 119 km NE Novokuznetsk, "Kuznetskii Alatau" State Reserve, upper stream of Nizhnyaya Ters river, sweeping near old road, 17.VIII.1996; **Republic of Khakassia:** 1 ♂, "Kyzas river, pr. Abakana, Tom. [*Tomskaya*] g. [*guberniya*], 11.VII [*year not indicated*], Yu. Vagner leg." (Territory of the Tashtypskii Raion of the Republic of Hakassia at present) (ZIN).

Trophic relations. In Europe was reared from leaf-mines on *Aster* sp. (cultured plants), *Callistephus chinensis*, *Chrysanthemum indicum*, *Senecio ovatus* and *Solidago virgaurea* (Ellis 2020). Trophic relations in the region have not been revealed, but leaf-mines were recorded on *Senecio nemorensis*, *Solidago dahurica* and *S. virgaurea*, but the imago could not be reared.

Distribution. West and East Europe; Russia: North-East and Central regions of European part, Southern Siberia (de Jong Yde et al. 2014; Fauna Europea 2020).

Cornutrypeta svetlanae Richter et Shcherbakov, 2000

Material. Altaiskii Krai: 1 ♂, 4 ♀, 51°03'34"N, 82°59'22"E, 50 km SEE Zmeinogorsk, Tigirekskii Mountain Range, 1360 m a.s.l., floodplain meadow of Malyi Tigirek river source, 7.VII.2012. **Republic of Altai:** 1 ♂, 51°31,901'N, 86°46,906'E, 55 km SSE Choya village, near Sagan mountain, 1670 m a.s.l., forest tall grass meadow,

20.VII.20009; 1 ♂, 49°37'27"N, 85°44'02"E, 72 km SEE Ust Koksa village, Zaichikha river, 26.VII.2013, leg. M.Yu. Proshchalykin. **Kemerovskaya Oblast, "Kuznetskii Alatau" State Reserve:** 1 ♂, 1 ♀, 81 km NE Novokuznetsk, Kuznetskii Alatau W slope to river Srednyaya Ters, 1300 m, grass subalpine meadow on stones, 9.VII.1998; 4 ♂, *ibidem*, Srednyaya Maganakova river basin, Krivaya river source, right bank, 1240 m, grass meadow with bushes, 17.VII.1998; 1 ♂, 86 km NE Novokuznetsk, Kuznetskii Alatau, polydominant subalpine meadow, 10.VII.1997; 3 ♀, *ibidem*, NW slope to Srednaya Средняя Ters river, 1250 m, subalpine meadow, 14.VII.1997; 2 ♂, 1 ♀, *ibidem*, S slope, to Verkhnyaya Ters river source, 1200 m, subalpine meadow, 15.VII.1998; 1 ♀, 87 km NE Novokuznetsk, Kuznetskii Alatau, 1320 m, polydominant subalpine meadow, on *Saussurea latifolia*, 10.VII.1997; 5 ♂, 88 km NE Novokuznetsk, Bolshoi Kanym mountain, NE slope, birch-pine forest, 26.VII.1998; 1 ♂, 90 km NE Novokuznetsk, N slope of Krestovaya mountain to valley of Mirnaya river, wet grass meadow, on *Saussurea latifolia* buds, 15.VII.1997; 1 ♀, *ibidem*, lower one third of N slope to Mirnaya river, 800 m, floodplain meadow, on *Saussurea latifolia*, 18.VII.1997; 1 ♂, 1 ♀, 93 km NE Novokuznetsk, Krestovaya mountain, N slope, Mirnaya river, middle stream, floodplain meadow, 18.VII.1997; 1 ♂, 112 km NE Novokuznetsk, Akchelbak mountain, E slope, foothill, 940 m, bog margin, 17.VII.1995; 2 ♀, 105 km NE Novokuznetsk, Pestraya mountain foothill, NW slope, Veselyi Akchelbak river, floodplain tall grass meadow, on *Saussurea latifolia* buds, 22.VII.1996; 1 ♂, 3 ♀, *ibidem*, N slope, 1100 м., polydominant subalpine meadow, on *Saussurea latifolia* buds, 22 & 23.VII.1996; 1 ♂, 113 km NE Novokuznetsk, Chemodan mountain, E slope, 1260 m, subalpine meadow, 9.VII.1994; 1 ♀, *ibidem*, W slope, foothills, 850 m, Kedrovyi spring, floodplain meadow, 20.VII.1994; 1 ♀, *ibidem*, S slope, subalpine meadow, on *Saussurea latifolia*, 2.VIII.1995; 2 ♂, *ibidem*, W slope, pediment, 850 m, valley of Kedrovyi spring, on *Saussurea latifolia*, 7, 19.VII.1996; 1 ♀, *ibidem*, 1160 m, sualpine grass meadow, 20.VII.1996; 2 ♀, *ibidem*, NW part, polydominant subalpine meadow, 20.VIII.1996; 1 ♂, *ibidem*, 1160 m, polydominant subalpine meadow, 28.VII.1997; 1 ♀, *ibidem*, on *Saussurea latifolia*, 15.VII.2000; 1 ♂, 119 km NE Novokuznetsk, upper stream of Nizhnyaya Ters river, tall grass meadow, 16.VII.1995, leg. L. Gorshkova; 1 ♀, *ibidem*, Zayachya mountain, S slope, 1000 m, tall grass subalpine meadow, 16.VII.1996. **Republic of Khakassia:** 1 ♂, 1 ♀, Shirinskii Raion, basin of Chernyi Iyus river, Spasskii stones, N slope, 1300 m, subalpine meadow, 16 & 24.VII.1992; 2 ♂, *ibidem*, 24.VII.1993, S.A. Krivets leg.; 1 ♂, *ibidem*, 6.VII.1993; 1 ♂, 16 km S of Kommunar village, Cheremnykh mountain, SE slope, 1110 m, new road, on *Cirsium heterophyllum*, 12.VII.1999; 1 ♀, *ibidem*, 1390 m, fragment of subalpine meadow at margin of stony loose rock, on *Saussurea latifolia*, 13.VII.1999; 1 ♀, ibidem, 1240 m, grassy subalpine meadow, on *Cirsium heterophyllum*, 14.VII.1999.

Trophic relations. Imagos of the species were collected from *Saussurea latifolia*, usually possessing leaf-mines, but rearing from the latter was not successful.

Distribution. Only recorded from mountains of southern Siberia.

Euleia Walker, 1835

Euleia heraclei (Linnaeus, 1758)

Material. Tomskaya Oblast: 1 ♀, 10 km SE Tomsk, from leaf-mines on *Heracleum dissectum*, 14.VIII.2007, imago emergence 27.XII.2007; 1 ♂, 1 ♀, *ibidem*, emergence 18.XII.2007; 1 ♂, *ibidem*, 19.VI.2010; **Kemerovskaya Oblast:** 1 ♀, 115 km NE Novokuznetsk, Kuznetskii Alatau, basin of Nizhnyaya Ters, Severnaya river, down stream, floodplain fir forest, from leaf-mines on *Heracleum dissectum*, 18.VII.2000, imago emergence 5 XI 2000, 18.VII.2000.

Trophic relations. In Europe has been reared from leaf-mines on *Aegopodium podagraria*, *Angelica archangelica*, *A. sylvestris*, *A. ursina*; *Anthriscus sylvestris*, *Apium graveolens*, *Berula erecta*, *Bupleurum* sp., *Cicuta virosa*, *Conioselinum* sp., *Conium maculatum*, *Coriandrum sativum*, *Daucus carota*, *Falcaria vulgaris*, *Heloscia-dium nodiflorum*, *Heracleum mantegazzianum*, *H. pubescens*, *H. sphondylium*, *Laserpitium sp.*, *Levisticum officinale*, *Ligusticum mutellina*, *L. scoticum*, *Molopospermum peloponnesiacum*, *Oenanthe crocata*, *Pastinaca sativa*, *Petroselinum crispum*, *Peucedanum carvifolia*, *P. cervaria*, *P. ostruthium*, *Pimpinella major*, *P. saxifraga*, *Pleurospermum austriacum*, *Seseli libanotis*, *Sium latifolium*, *S. sisarum*, *Smyrnium olusatrum*, *Thapsia villosa* and *Torilis arvensis* (Ellis 2020). In the region was reared from leaf-mines on *Heracleum dissectum*.

Distribution. Europe, North Africa, Middle and Central Asia, Japan; Russia: European part, West Siberia, the Russian Far East (Korneyev, Ovtshinnikova 2004).

Euleia rotundiventris (Fallen, 1814)

Material. Tomskaya Oblast: 1 ♂, 3 ♀, 15 km NNE Kozhevnikovo vill., 10.VII.2009; **Tomsk:** 1 ♂, experimental area of Botanical Garden, 20.VI.2008; 1 ♂, southern uptown, birch-grass forest, 26.VI.2003; 1 ♀, *ibidem*, 8.VI.2009; 1 ♂, terraces of right bank of Tom rover, 19.VI.2009. **Kemerovskaya Oblast:** 1 ♀, 90 km NE Novokuznetsk, Kuznetskii Alatau, Krestovaya mountain, lower one third of N slope to Mirnaya river, 800 m a.s.l., floodplain meadow, on *Saussurea latifolia*, 18.VII.1997.

Trophic relations. In comparison with a major number of the other congeners, this species is connected with Apiaceae plants. In Europe was reared from leaf-mines on *Aegopodium podagraria*, *Angelica sylvestris* and *Heracleum sphondylium* (Ellis 2020). Trophic relations in the region have not been investigated.

Distribution. North and Middle Europe, Kazakhstan, Russia: NE and central regions of European part, South Siberia (de Jong Yde et al. 2014; Fauna Europea 2020).

Hemilea Loew, 1862

Hemilea dimidiata (Costa, 1844)

Material. Tomskaya Oblast, Tomsk: 1 ♀, experimental area of Botanical Garden, 20.VI.2008; 1 ♀, southern uptown, 8.VI.2009; 1 ♂, *ibidem*, 24.VI.2009; 1 ♂, *ibidem*, 22.VI.2008; 1 ♂, terraces of right bank of Tom rover, 19.VI.2009; 1 ♀, Burevestnik stadium, 6.VII.2010, leg. Ya. Annenkova; 1 ♀, 10 km SE Tomsk, 25.VI.2006; 1 ♀, ibidem, 12.VI.2007.; 2 ♀, ibidem, 19.VI.2010.

Trophic relations. In Europe has been reared from leaf-mines on *Hieracium*, *Lactuca* and *Taraxacum* spp. (Merz 1994). Trophic relations in the region have not been investigated.

Distribution. Central and South Europe, Turkey; Russia: Central and Southern regions of European part, South Siberia (de Jong Yde et al. 2014; Korneyev, Korneyev 2015; Fauna Europea 2020).

Philophylla Rondani, 1870

Philophylla caesio (Harris, 1780)

Material. Altaiskii Krai: 1 ♂, 7 km SW of Biisk, Kanonerskoe lake, mixed grass meadow, 26.VI.2003; 1 ♂, 51°09'38"N, 83°01'50"E, 54 km E of Zmeinogorsk, near Tigirek village, 475 m a.s.l., mixed grass near road, 11.VII.2012. **Republic of Altai:** 1 ♀, 51°37'11"N, 85°42'22"E, 36 km N of Shebalino village, near Kamlak village, 382 m a.s.l., mixed grass forest, 20.VII.2012; 1 ♀, 51°37'29"N, 85°42'06"E, *ibidem*, mixed forest in valley of Sema river, 27.VII.2012; 1 ♂, 1 ♀, 50°36'17"N, 86°29'37"E, 30 km SE Ongudai village, 701 m a.s.l., right bank of Bolshoi Ilgumen river, Kur-Kechu hole, forest, 23 & 24.VII.2015. **Tomskaya Oblast, Tomsk:** 1 ♂, "Universitetskaya roshcha" park in city centre, 21.VI.2007; 1 ♂, 1 ♀, *idem*, 26.VI.2008; 2 ♂, *ibidem*, 29.VI.2014; 1 ♀, southern uptown, 22.VI.2008; 1 ♂, experimental area of Botanical Garden, 27.VI.2012.

Trophic relations. Urtica dioica (Urticaceae) (Ellis 2020). A number of references provide data on the trophic relations of the species such as leaf-miners on stinging nettle, but in the *Key to Tephritid Flies of Great Britain* I, White (1988) commented on data by Beiger (1968) regarding mines located in the leaf petiole, but not the leaf lamina (White 1988). In *A Handbook Plant Parasites of Europe* devoted to leaf-miners, galls and fungal infection, this species is regarded as an inhabitant of stems lacking gall generation (Ellis 2020). A reference to the biology of *Myoleja caesio* was overlooked during the compilation of this *Handbook*. Ferrar (1987) noted that Beiger (1968) reared *Philophylla caesio* from mines in the petioles of an *Urtica* sp. (Urticaceae). The larva is described as having 19-20 anterior spiracle lobes, a number typical of stem- and leaf-mining Trypetini.

Distribution. Europe, Middle East, China; Russia: East and Central regions of European part, South Siberia, the Russian Far East (Korneyev, Ovtshinnikova 2004).

Stemonocera Rondani, 1870

Stemonocera cornuta (Scopoli, 1772)

Material. Altaiskii Krai: 1 ♂, 51°21'20"N, 84°33'21"E, 35 km SE Soloneshnoe, valley of Shinok river, taiga, 26.VI.2016, leg. P. Nefediev. **Republic of Altai:** 1 ♂, valley of Chulyshman, Biysk[*ii*] u[*uezd*] [*Territory of Ulaganskii Raion of Republic of Altai at present*], 22.VI.912, leg. Yurganova. (ZIN). **Republic of Khakassia:** 1 ♀, 8 km S of Kommunar village, Cheremnykh mountain, SE slope, 1120 m a.s.l., grass-fir forest, 15.VII.1999.

Trophic relations. In Europe was reared from leaf-mines on *Adenostyles alliariae*, *A. alpina*, *Eupatorium cannabinum*, *Jacobaea vulgaris*, *Petasites hybridus*, *Senecio nemorensis* and *Tussilago farfara* (Ellis 2020). Trophic relations in the region have not been investigated, but leaf-mines were noted on *Senecio nemorensis* and *Tussilago farfara*.

Distribution. North and Central Europe, Central Asia, China, Japan; Russia: Central regions of European part, South Siberia, the Russian Far East (Korneyev, Ovtshinnikova 2004).

Trypeta Meigen, 1803

Trypeta artemisiae (Fabricius, 1794)

Material. Altaiskii Krai: 1 ♀, 51°11'12"N, 82°59'58"E, 54 km E of Zmeinogorsk, near Tigirek village, 806 m a.s.l., mixed grass in narrow gully, 5.VIII.2011. **Republic of Altai:** 1 (specimen lacking abdomen) Kirsai, Teletskoe lake, Tomsk[*aya*] g[*uberniya*], 5.VII. [*19*]09, leg. Emelianov (ZIN); 1 ♀, 50°43'29"N, 86°15'40"E, 8 km SE km SE Ongudai village, valley of Ursul river, 754 m a.s.l., steppe meadow, 24.VII.2010; 22 km SEE Aktash village, Kuraiskii mountain range, S slope, Ortolyk spring hole, 1847 m a.s.l., sparse larch forest, 28.VII.2011; 3 ♂, 3 ♀, 50°36'17"N, 86°29'37"E, 30 km SE Ongudai village, 701 m a.s.l., right bank of Bolshoi Ilgumen river, Kur-Kechu hole, forest, 23, 24.VII.2015; 1 ♀, Altaiskaya Semipalat. Marakul village, 23-25.VI.[*18*]99, leg. Kaznakov. (Present administrative location is not exactly defined) (ZIN). **Kemerovskaya Oblast:** 1 ♂, Anzhero-Sudzhensk, near Anzherskoe lake, 20.VI.2007, leg. Sheleng. **Republic of Khakassia:** 1 ♀, 54°27'35"N, 89°26'05"E, 34 km SWW Shira village, near Efremkino village, 479 m a.s.l., valley of Belyi Iyus river, 3.VIII.2019; 37 km SE Ongudai village, 690 m a.s.l., bank of Bolshoi Yaloman river, bushes on bank, 24.VII.2015; 4 ♂, 1 ♀, 50°36'17"N, 86°29'37"E, 30 km SE Ongudai village, 701 m a.s.l., right bank of Bolshoi Ilgumen river, Kur-Kechu hole, forest, 23 & 24.VII.2015.

Trophic relations. In Europe has been reared from leaf-mines on *Achillea biserrata*, *A. ptarmica*, *Artemisia absinthium*, *A. gnaphalioides*, *A. moxa*, *A. vulgaris*, *Chrysanthemum indicum*, *Eupatorium cannabinum*, *Senecio nemorensis*, *Tanacetum corymbosum*, *T. macrophyllum*, *T. parthenium* and *T. vulgare* (Ellis 2020).

Distribution. Russia: N and Central regions of European part, West and East Siberia, the Russian Far East; Central Asia, Mongolia, China, Korea, Japan (Korneyev, Ovtshinnikova 2004).

Trypeta immaculata (Macquart, 1835)

Material. Republic of Altai: 1 ♂, Baigol river, tributary of Biya river (Territory of Turochakskii Raion of Republic of Altai at present), 26-27.VI.[1]912 leg. Sushkin, Redikortsev (ZIN); 1 ♀, 50°31'14"N, 86°33'41"E, 37 km SE Ongudai village, 690 m a.s.l., bushes bank of Bolshoi Yaloman river, 24.VII.2015; 4 ♂, 1 ♀, 50°36'17"N, 86°29'37"E, 30 km SE Ongudai village, 701 m a.s.l., right bank of Bolshoi Ilgumen river, Kur-Kechu hole, forest, 23 & 24.VII.2015 leg.; 1 ♀, "Kara-Marchi (*Present administrative location is not defined*), 11.VII.[18]97, leg. Yu. Vagner (ZIN). **Tomskaya Oblast, Tomsk:** 1 ♀, "Universitetskaya roshcha" park in city centre, 9.VI.2007; 1 ♀, experimental area of Botanical Garden, 20.VI.2008; 1 ♀, *idem*, 23.VI.2009; 1 ♂, *idem*, 26.VI.2010; 1 ♀, 10 km S of Tomsk, 20.VI.2009. **Kemerovskaya Oblast:** 1 ♂, Chemerichkina village, 27.VI.949, leg. B. Rodendorf, [*Territory of Topkinskii Raion of Kemerovskaya Oblast*] (ZIN); 1 ♀, 81 km NE Novokuznetsk, Kuznetskii Alatau, Srednyaya Maganakova river basin, Krivaya river source, right bank, 1240 m, grass meadow with bushes, 17.VII.1998; 1 ♂, 88 km NE Novokuznetsk, Bolshoi Kanym mountain, NW slope, birch-pine forest, 26.VII.1998; 1 ♂, 113 km NE Novokuznetsk, Chemodan mountain, W slope, pediment, 850 m a.s.l., Kedrovyi spring, on pebbles, 29.VII.1997. **Republic of Khakassia:** 1 ♀, 54°27'35"N, 89°26'05"E, 34 km SWW Shira village, near Efremkino village, 479 m a.s.l., valley of Belyi Iyus river, 3.VIII.2019; 1 ♂, Ust[*ie*] of Matur river, Abakan, Tom[*skaya*] g[*uberniya*], 30.VI.[*18*]97, leg. Yu. Vagner" (Territory of the Tashtypskii Raion of the Republic of Hakassia at present) (ZIN).

Trophic relations. In Europe has been reared from leaf-mines on *Aposeris foetida*, *Crepis paludosa*, *Hieracium laevigatum*, *H. murorum*, *H. sabaudumm*, *Hypochaeris* spp., *Lactuca muralis*, *Lapsana communis*, *Leontodon hispidus*, *Picris hieracioides*, *Pilosella officinarum*, *Prenanthes purpura*, *Scorzoneroides autumnalis*, *Sonchus arvensis* and *Taraxacum officinale* (Ellis 2020). Trophic relations in the region have not been investigated as all specimens were collected by net sweeping.

Distribution. Europe, China, Japan, Russia: NW and Central regions of European part, Siberia, the Russian Far East (Korneyev, Ovtshinnikova 2004).

Trypeta zoe Meigen, 1826

Material. Republic of Altai: 1 ♀, 51°37'29"N, 85°42'06"E, 36 km N Shebalino, near Kamlak village, 382 m a.s.l., mixed forest in valley of Sema river, 27.VII.2012. **Republic of Khakassia:** 1 ♂, 2 ♀, 54°27'35"N, 89°26'05"E, 34 km SWW Shira village, near Efremkino village, 479 m a.s.l., valley of Belyi Iyus river, 3.VIII.2019.

Trophic relations. In Europe was reared from leaf-mines on *Achillea* spp., *Adenostyles alliariae*, *A. alpina*, *Artemisia vulgaris*, *Aster* spp., *Chrysanthemum indicum*, *Ch. maximum*, *Coleostephus paludosus*, *Doronicum orientale*, *D. pardalianches*, *Eupatorium cannabinum*, *Jacobaea alpina*, *J. erucifolia*, *Lactuca* spp., *Leucanthemum atratum*, *L. maximum*, *L. vulgare*, *Ligularia* spp.; *Matricaria* spp., *Petasites albus*, *P. hybridus*, *Senecio nemorensis*, *S. squalidus*, *S. sylvaticus*, *S. vulgaris*, *Tanacetum parthenium*, *T. vulgare* and *Tussilago farfara* (Ellis 2020). Trophic relations have not been investigated in the region.

Distribution. Europe; Russia: European part, Southern Siberia, the Russian Far East (Korneyev, Ovtshinnikova 2004).

Discussion

Analysis of leaf-miner tephritid fly species of the south-eastern part of West Siberia showed *Cornutrypeta svetlanae* Richter & Shcherbakov, 2000 to be the most numerous species, registered in four regions; it is the most widely distributed species preferring the forest belt in the Kuznetskii Alatau mountains (Kemerovskaya Oblast and Khakassia), North Altai mountain (Republic of Altai) and West Altai (Altaiskii Krai). Two species are registered in only one region, namely *Cornutrypeta spinifrons* (Schroeder, 1913) in the forest belt of Kuznetskii Alatau mountains (Kemerovskaya Oblast) and *Hemilea dimidiata* (Costa, 1844) in the forest meadows of Tomskaya Oblast.

Leaf-miner tephritid species are not large in number in comparison with the other representatives of the family which inhabit Asteraceae inflorescences. The rarest species, *Cornutrypeta spinifrons* (Schroeder, 1913) is known by a single specimen, and *Trypeta zoe* Meigen, 1826, also previously known from a single specimen, is currently found in several localities. According to A. Humala and A. Polevoy this species is rare and in Finland belongs to the Red Data NT category and therefore threatened with extinction in the near future, although it does not currently qualify for the threatened status (Humala, Polevoi 2015).

The share of leaf-miner species in the tephritid fly fauna of the region is 10.2% that corresponds with the data from other regions such as Great Britain (11%) (White 1988), Switzerland (8.3%) (Merz 1994) and the Ussuriisky State Reserve in the Asian part of Russia (9.6%) (Galinskaya, Ovtshinnikova 2014).

The study of trophic relations in leaf-miner tephritids is difficult because is not always possible to organize favourable conditions for larval and imago development. Up to date, only two species have been bred after regular collecting in different regions. *Acidia cognata* collected in Kuznetsky Alatau, Kemerovskaya Oblast was reared from leaf-mines on *Petasites radiatus*, and in Tomskaya Oblast from leaf mines on *Tussilago farfara*. *Euleia heraclei* was reared from leaf-mines of *Heracleum dissectum* in all collecting localities of the species. All other species have been collected strictly by the use of an entomological sweep net.

At present, the fauna of leaf-miner tephritid flies of the south-eastern part of West Siberia is almost completely revealed; the number of species could only be increased by a detailed study of the adjoining regions to the south. However, an improvement of imago rearing from leaf-mines could help in the determination of trophic relations and the distribution of the recorded species.

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